S
665.5
01 B
1920

STATE OF MONTANA

BULLETIN

State Oil Commission

Report of the

STATE CHEMIST

Motor Car Gasoline and
Kerosene

STATE DOCUMENTS COLLECTION

AUG 10 2005

MONTANA STATE LIBR
1515 E. 6th AV
HELENA

BULLETIN NO. 2
NOVEMBER 30, 1920

INDEPENDENT PUBLISHING CO.
HELENA, MONTANA

Montana State Library
3 0864 1003 3807 1

STATE OF MONTANA

BULLETIN

OF THE

State Oil Commission

Report of the
STATE CHEMIST

Motor Car Gasoline and
Kerosene

BULLETIN NO. 2
NOVEMBER 30, 1920

INDEPENDENT PUBLISHING CO.
HELENA, MONTANA

Digitized by the Internet Archive
in 2016

https://archive.org/details/reportofstateche1920mont

STATE OF MONTANA
STATE OIL COMMISSION

Helena

S. V. Stewart, Governor
S. C. Ford, Attorney General
C. T. Stewart, Secretary of State
Ex-officio State Oil Inspector
W. I. Ballard, Deputy Oil Inspector

STATE OIL LABORATORY

Montana State College
Bozeman

W. M. Cobleigh, State Chemist
*E. R. Norris, Analyst
L. C. Humphrey, Analyst

*Resigned September 1st.

OFFICE OF THE STATE CHEMIST

Bozeman, Montana, November 30th, 1920.

Hon. C. T. Stewart,
Secretary of State,
Helena, Montana.

Dear Sir:

I have the honor to transmit the second report of this office covering analytical examinations of gasoline and kerosene samples collected by the deputy oil inspector.

This work was performed under provisions of the State Oil Inspection Law enacted by the last Legislative Assembly.

The analytical data is too voluminous for the publication of details and, therefore, I am reporting all data in the form of averages which I believe wil be just as effective as a detailed report on specific samples.

I beg leave to advise that the laboratory has done considerable preliminary work on the examinations of lubricating oils. A record of this work will follow in a subsequent report.

Respectfully submitted,
W. M. COBLEIGH,
State Chemist.

MOTOR GASOLINE AND KEROSENE

Introduction

This report is prepared under the authority of Chapter 203, Session Laws of the State of Montana. This chapter of the Session Laws contains provisions for regulating the quality of motor gasoline, kerosene, lubricating oil and other petroleum products offered for sale in Montana. The inspection of petroleum products and the operation of the laboratory are governed by rules and regulations which have been adopted under the provisions of the oil law.

The report which follows gives a general summary of the analytical investigations conducted since May 10th, 1919, a more detailed summaries of the investigations of gasoline and kerosene samples submitted to the laboratory since March 1st, 1920.

In addition to the summaries of the analytical data the report contains a description of the method of testing gasoline in order that proper interpretations may be made. The work of the Oil Laboratory began May 10th, 1919. Since that date samples of petroleum products have been submitted by the State Oil Inspector from the following cities and towns:

Anaconda
Antelope
Bainville
Belgrade
Belt
Big Sandy
Big Timber
Billings
Bozeman
Butte
Cascade
Chester
Chinook
Choteau
Clyde Park
Conrad
Columbus
Culbertson
Cut Bank
Deer Lodge
Denton
Dillon
Dodson
Drummond
Dutton
Eureka
Fairview
Flaxville
Forsyth
Fort Benton
Frazer
Froid
Geyser
Gildford
Glasgow
Glendive
Grass Range
Great Falls
Hamilton
Hardin
Harlem
Harlowton
Havre
Helena
Hingham
Homestead
Jefferson Island
Joplin
Joliet
Judith Gap
Kalispell
Kremlin
Laurel
Lewistown
Livingston
Moccasin
Maddox
Malta
Manhattan
Medicine Lake
Miles City
Missoula
Mondak
Moore
Nashua
Norris
Oswego
Philipsburg
Plains
Plentywood
Polson
Poplin
Ravalli
Redstone
Red Lodge
Reserve
Ronan
Roundup
Rudyard
Saco
Scobey
Shelby
Sheridan
Sidney
Stanford
Stevensville
Terry
Thompson Falls
Three Forks
Townsend
Twin Bridges
Whitefish
Whitehall
Wibaux
Winnett
Wolf Point

Gasoline

The retailers or jobbers from whom gasoline samples were purchased are submitted below:

Adams Oil Co., Choteau; Auto Gas and Oil Co., Butte; Automobile Warehouse and Sales Co., Helena; Battery Service Station, Livingston; Bendon Auto Supply Co., Sidney; Branscombe and O'Neill Co., Deer Lodge; Butte Auto Co., Butte; Chas. H. Branscombe, Anaconda; City Oil House, Butte; H. Earl Clark Co., Big Sandy, Fort Benton, Havre, Kalispell, Kremlin; Central Oil Co., Helena; Consumers Oil Co., Harlowton; Continental Oil Co., Anaconda, Belgrade, Belt, Big Sandy, Big Timber, Billings, Bozeman, Butte, Cascade, Chester, Chinook, Choteau, Columbus, Conrad, Culbertson, Cut Bank, Deer Lodge, Dillon, Dodson, Dutton, Drummond, Eureka,Fairview, Flaxville, Forsyth, Fort Benton, Froid, Geyser, Gilford, Glasgow, Glendive, Grass Range, Great Falls, Hamilton, Hardin, Harlem, Harlowton, Havre, Helena, Hingham, Joliet, Judith Gap, Kalispell, Kremlin, Laurel, Lewistown, Livingston, Malta, Manhattan, Medicine Lake, Miles City, Missoula, Mondak, Moore, Nashua, Plains, Plentywood, Polson, Poplar, Red Lodge, Ronan, Roundup,' Saco, Scobey, Shelby, Sidney, Stanford, Terry, Three Forks, Townsend, Twin Bridges, Wibaux, Winnett, Whitehall, Whitefish, Wolf Point; Continental Service Station, Great Falls; Craven Garage, Butte; Farmers Oil Co., Scobey; Froid Auto Co., Froid; Flaxville Oil Co., Flaxville; Gem City Motor Co., Sidney; Great Falls Gas and Oil Service Co., Great Falls; Grey Lindesman Oil Co., Bainville, Frazer, Oswego, Plentywood, Redstone; Haskell Motor Co., Glendive; Helena Motor Garage, Helena; Helena Gas Service Co., Helena; Hover Grain and Oil Co., Antelope, Reserve; Hughes Oil Co., Glendive, Homestead, Miles City, Scobey, Sidney, Terry, Wibaux; Independent Oil Co., Missoula; International Oil Co., Fairview, N. D.; Kennedy Motor Co., Missoula; Keysers Garage, Bozeman; Liberty Oil Co., Lewistown; M. Leans, Whitefish; Montana Oil Co., Big Sandy, Big Timber, Billings, Columbus, Glasgow, Great Falls, Harlowton, Helena, Kalispell, Lewistown, Livingston, Malta, Polson, Roundup, McCarty and McHatten Garage, Helena; Mitchell Auto Filling Station, Livingston; Mutual Oil Co., Big Sandy, Big Timber, Billings, Cascade, Chinook, Columbus, Conrad, Cut Bank, Deer Lodge, Denton, Dodson, Dutton, Fort Benton, Gilford, Glasgow, Great Falls, Harlem, Harlowton, Havre, Helena, Hingham, Joplin, Kalispell, Lewistown, Livingston, Moccasin, Malta, Missoula, Polson, Poplar, Ravalli, Ronan, Roundup, Rudyard, Saco, Shelby, Sheridan, Stevensville, Three Forks, Townsend, Winnett, Wolf Point; Pennsylvania Oil Co., Dillon; Philipsburg Garage, Philipsburg; Pure Oil Co., Bozeman, Great Falls, Jefferson Island, Lewistown, Miles City, Stan--ford; Rinda Service Co., Helena; Scobey Oil Co., Maddox, Scobey; Silverbow Motor Co., Butte; Story Motor Supply Co., Bozeman; Tepic Motor Co., Forsyth; Texas Oil Co., Billings, Butte, Forsyth, Great Falls, Helena, Livingston, Lewistown, Manhattan, Miles City, Missoula, Red Lodge; Tubbs Oil Company, Harlem; Vetters Filling Station, Bozeman; Walkers Garage, Helena; Westland Oil Co., Bainville, Froid, Plentywood, Scobey; Western Auto and Supply Co., Helena, Scobey; Western Waber Batterson Co., Helena.

Refineries Furnishing Gasoline to Montana Markets.

From information on the inspector's data cards, the following list of refineries furnishing gasoline to Montana markets has ben prepared:

California—Gilmore Refining Company, Los Angeles.

Kansas—El Dorado Refining Company, El Dorado; Empire Refining Company, Independence; Midland Refining Company, El Dorado, Standard Asphalt and Refining Company, Independence; Sterling Oil and Refining Company, Wichita; Vickers Marsh Oil Company, Potwin; Vickers Marshall Oil and Refining Company, Wichita; White Eagle Refining Company, Augusta.

Missouri—Evans Thewing Refining Company, Kansas City; Universal Petroleum and Refining Company, Kansas City.

Oklahoma—Cushing Refining Company, Cushing; Marrland Refining Company, Ponca City; Mid-Continent Gasoline Company, West Tulsa; Rogers Brothers, Allen; Sinclair Oil and Refining Company, Cushing; Western Product and Refining Company, Yale; Yale Oil Refining Company, Yale; Western Oil Corporation, Tulsa; Champlain Refining Company, Enid; Empire Refineries, Ponca City, Cushing; Cosden and Company, Tulsa; Sapulpa Refining Co., Sapulpa.

Texas—White Eagle Refining Company, Burkburnell; Texas Oil Refining Company, Huston.

Wyoming—Glenrock Refining Company, Glenrock; Midwest Refining Company, Greybull, Mutual Producing and Refining Company, Glenrock; Northwestern Oil and Refining Company, Cowley.

Summary of Laboratory Investigations

May 19th, 1919, to November 30th, 1920.

Gasoline samples official	692
Gasoline samples unofficial	42
Kerosene samples official	450
Total samples examined	1,184

The unofficial gasoline samples referred to in the tabulation were not submitted by the State Oil Inspector. These samples were analyzed for informational purposes. The samples were examined in the course of special studies of the laboratory methods of examining motor gasoline. A large number of analyses were made for the purposes of comparing the results of this laboratory with the results of other laboratories.

Types of Gasoline.

The gasolines sold on the Montana markets are produced by several general methods and can be classified as follows:

1. Straight refinery gasoline
2. Blended casing head gasoline
3. Cracked and blended gasolines.

For further information on types of gasoline and their properties, the reader is referred to publications of the Bureau of Mines and to books on the subject of petroleum refining.

*General Properties of Satisfactory Gasoline

"The fundamental principle upon which gasoline tests and specifications must be based is that quality is not inherent but is determined by the service required. For instance, gasoline that is entirely satisfactory in present-day cars or

---

E. W. Dean.

*Technical Paper 214, Bureau of Mines-Motor Gasolines, by trucks might have been almost useless in the cars of several years ago and would not serve in airplane motors at all. Hence, a discussion of the desirable properties of gasoline must be confined to general statements and then if reduced to specifications, must take into account the conditions of use. The essentially desirable properties of gasoline may be summarized briefly as follows:

1. The gasoline should not contain too large a percentage of highly volatile products, which tend to cause large evaporation losses and excessive danger in handling and storage, but should have enough volatile constituents to permit starting an engine under reasonably unfavorable conditions, without preheating.

2. The gasoline should not contain any considerable percentages of heavy or non-volatile constitutents, which after atomization into the engine cylinders cannot be completely vaporized and burned.

3. The gasoline should not contain material that after combustion leaves a residue that collects in the motor.

4. The gasoline should be free from substances that attack metal either before or after combustion. Unremoved acid (used in refining) falls under this head.

5. Neither the gasoline nor its products of combustion should have a strong or markedly disagreeable odor as this is objectionable to users of automobiles.

6. The gasoline should be free from non-combustible material such as water and sediment.

These stated requirements are simple in principle and are almost axiomatic. The chief problem is to fix limits, defined by actual tests that will satisfy the desirable conditions."

*"Testing Gasoline"

"One of the most desirable conditions to be attained in the development of technical or comercial undertakings is that producers and users shall be able to determine the relative desirability of commodities on the basis of simple and

---

*Technical Paper 214, Bureau of Mines-Motor Gasolines, by E. W. Dean.

accurate tests. Up to a recent date, such a condition has not been reached in regard to gasoline, and it was believed that satisfactory specifications, based on laboratory tests, could not be written for commercial transactions in this commodity. Claims were frequently made that actual use constituted the only adequate test for the value of gasoline.

It is now definitely established that the most unreliable test in vogue for gasoline is that of the average user who "tries it out" in his car. Engine tests, if conducted in the laboratory in connection with power measurements, are still the last word in determining the utility of motor fuel, but the internal-combustion motor is so complex a mechanism that it cannot be made to serve as an analytical instrument except when handled by experts. Properly interpreted results of an analysis in the chemical laboratory give more reliable information concerning the utility of a grade of gasoline than anything less than the most elaborately conducted engine-dynamometer tests or the collective experience of a large number of users.

In the course of the past two or three years, rational methods for analyzing and grading gasoline have come into vogue."

The Montana Specification for Motor Gasoline

"That the standards of quality and strength for gasoline kept for sale or offered for sale within the State of Montana shall be as follows: That all gasoline kept or offered for sale within the State of Montana shall conform to the following standard specifications.

1. It shall be free from water and other foreign matter and deodorized.

2. I shall not contain any acid in sufficient quantity to be disclosed by the official litmus test.

3. Its volatility as determined by the standard distillation method shall meet the following requirements:

A. The temperature read on the thermometer when the first drop falls into the receiver shall not be below ninety-five (95°) degrees Fahrenheit nor above 140° Fahrenheit.

B. The temperature read when twenty per cent has distilled shall not be below 158° Fahrenheit nor above 221° Fahrenheit.

C. The temperature read when fifty per cent has distilled shall not be above 275° Fahrenheit.

D. The temperature read when ninety per cent has distilled shall not be above 390° Fahrenheit.

E. The dry point shall not be above 460° Fahrenheit.

F. Tolerance: If either the twenty per cent or the ninety per cent temperature mark is above the required limit of an amount not exceeding 18° Fahrenheit, the gasoline may be considered acceptable if the sum of the two temperatures read for the twenty per cent and the ninety per cent marks does not exceed the sum of the adopted limits. Provided, however, that the State Board of Examiners, shall be authorized to change or modify the standard specifications herein prescribed whenever in its judgment such change is necessary in order to conform to changing conditions of supply and demand or improvements in motor design; and providing further that whenever the Bureau of Mines of the Department of the Interior of the United States shall hereafter prescribe for the several states a uniform standard specification for motor gasoline, such specifications shall supercede those in this Act provided".

Methods of Testing Gasoline

The apparatus for conducting the volatility test given in the specification is illustrated in figure 1, copied from Technical Paper 214, Bureau of Mines.

Moon Shine Still

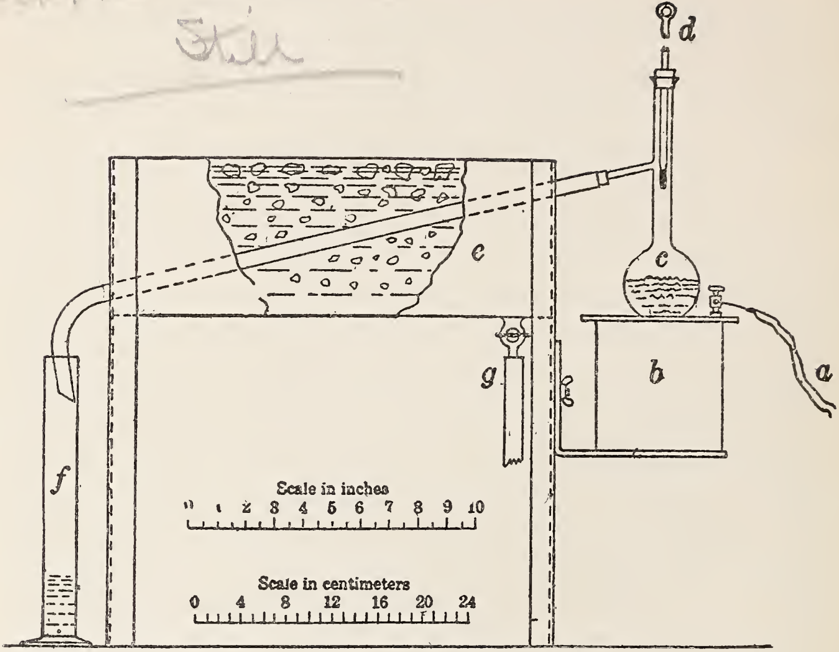

Figure 1—Apparatus used by the Bureau of Mines for distillation test of gasoline. a Wires connecting with electric mains through a suitable rheostat. b Electric heater. c Engler distillation flask filled with charge of gasoline partly distilled. d Thermometer. e Condenser, with trough filled with ice and water. f Receiving graduate. g Cock for draining condenser trough.

A gasoline sample is placed in flask c. Heat is applied by means of the electric heater b. The gasoline in the flask boils and the vapors condense in the condenser c. The distillate is collected in the graduate cylinder f. The temperature at which the first drop falls into the receiver f is called the initial boiling point. A thermometer reading is again taken when 20% of the gasoline in the flask has distilled into the receiver f. Similarly readings are taken when 50% and 90% have distilled over. The final reading or dry point is the temperature at which the flask has boiled dry and the thermometer reading has reached a maximum and then starts to recede consistently.

....Comparison of the Laboratory Tests with the Montana.... Specification

A total of 350 official gasoline samples collected during the period covered by this report (March 1st, 1920, to November 30th, 1920) have been analyzed. The analytical data have been studied to determine what proportion of the samples satisfy each requirement of the specification and what proportion satisfy all requirements.

The following table shows the results of this study:

Specification Mark	Initial Boiling Point	20%	50%	90%	Dry Point
Maximum distillation temperature—degrees Fahrenheit	140	221	275	390	460
Per centum of samples tested satisfying each limit requirement	96.8	98.8	96.2	89.4	93.4

Percentum passing all requirements 83.1%
Percentum classed as passed 94.2%

89.4% of the gasoline samples examined satisfied the 90% requirement of the standard specification. Fewer samples passed this requirement than any other mark specified in the standard. However, all samples which satisfied this requirement did not satisfy all other requirements and consequently calculations show that 83.1% of the samples passed the requirements for all the distillation marks.

On the other hand it should be observed that some of the samples which did not satisfy all the requirements have been classed as "passed". 94.2% of the total have been so rated.

The Montana standard specifies a tolerance for the 90% mark and in order to avoid unjust discriminations against certain gasolines, reasonable tolerances should be permitted. Interpretations of analyses and classifications of different gasolines under the standard should be based on the relations observed in the complete analytical data for each sample and not necessarily on any one distillation mark which may not meet the specification exactly.

Comparison of the Analytical Data with the Government Specifications.

All departments of the government purchase motor gasoline under specifications adopted by the Committee on Standardization of Petroleum Products created by order of President Wilson, dated July 31st, 1918. This specification controls government purchases only and is not binding upon the trade when dealing with other users of gasoline.

While the government specification was prepared on the basis of information furnished by the Bureau of Mines, still neither the Bureau of Mines nor the Committee on Standardization has recommended a specification for adoption by the several states.

Government Specification for Motor Gasoline.

"Quality—Gasoline to be high grade, refined, and free from water and all impurities, and shall have a vapor tension not greater than 10 pounds per square inch at 100° F. temperature, same to be determined in accordance with the current rules and regulations for the transportation of explosives and other dangerous articles by freight," as issued by the Interstate Commerce Commission.

Inspection—Before acceptance the gasoline will be inspected. Samples of each lot will be taken at random. These samples immediately after drawing will be retained in a clean, absolutely tight closed vessel and a sample for test taken from the mixture in this vessel directly into the test vessel.

Specifications:

(a) Boiling point must not be higher than 60° C. (140° F.)

(b) 20 per cent of the sample must distill below 105° C. (221° F.)

(c) 50 per cent must distill below 140° C. (284° F.)

(d) 90 per cent must distill below 190° C. (374° F.)

(e) The end or dry point of distillation must not be higher than 225° C. (437° F.)

(f) Not less than 95 per cent of the liquid will be recovered in the receiver from distillation.

Test—One hundred cubic centimeters will be taken as a test sample. The apparatus and method of conducting the distillation test shall be that adopted by Sub-Committee XI of Committee D-1 of the American Society for Testing Materials.

The following table shows how the gasoline samples included in this report compare with the government specifications.

Specification Mark	Initial Boiling Point	20%	50%	90%	Dry Point
Maximum distillation temperature—degrees Fahrenheit	140	221	284	374	437
Per centum of samples tested satisfying each limit requirement	97.1	98.8	98.8	41.1	21.7
Percentum passing all requirements				16.2%	

21.7% of the gasoline samples satisfied the dry point requirement of the standard specification. Fewer samples passed this requirement than any other mark specified in the standard. However, all samples which satisfied this requirement did not satisfy all other requirements and consequently calculations show that 16.2% of the samples passed the requirements for all the distillation marks.

Summary—Gasoline

Tabulations showing the analytical data for individual gasoline samples are not included in this report. A report containing such data would be too voluminous. It is possible, however, from general statements deduced from the analytical tests to obtain an excellent idea of the present quality of market gasoline in Montana and also to ascertain the results accomplished by the operation of the oil law.

The Montana specification for motor gasoline would be classed as a liberal one even from the producers standpoint. This was intentional because at the time the specification was prepared, market conditions were quite unsettled and a liberal standard was desirable.

When the gasoline on Montana markets was rated by this liberal specification, the state oil inspector found that a large proportion of the gasoline stocks on hand when the oil law went into effect (May 10th, 1919,) were not up to standard and were in many instances unsatisfactory to the automobile owners. Consequently the state oil inspector issued orders to all dealers who carried this character of gasoline in stock, to discontinue the sale of the same under the name "motor gasoline" and issued instructions that gasoline below the standard test must be sold as "engine distillate" as provided for in the oil law.

As soon as the poor stocks of gasoline on hand were disposed of, a marked improvement in the quality of market gasoline was observed. Dealers were able to secure gasoline of better quality and as inspections and laboratory tests have proceeded, there has been a continuous improvment in the quality of motor gasoline on Montana markets.

The following data are offered to support the above statement:

	Number of samples tested	Per centum satisfying all requirements of the specification
May 10th, 1919—June 1st, 1920	265	23%
Jan. 1st to March 1st	77	77%
March 1st to December 1st	350	83%

The standard governing government purchases calls for gasoline with lower analytical constants than the Montana specification. That is to say, a higher grade of gasoline is specified for government use. It is quite generally believed that the government specification is more rigid than is necesary for a state standard. However, a considerable portion of the gasoline on the Montana market today conforms to the government specification.

The laboratory data shows that 265 gasoline samples were tested between May 10th, 1919, and January 1st, 1920, and that 10.6% of these samples had analytical constants that conformed to the government standard in all its requirements. The amount of gasoline on the market that conforms to this standard is increasing as shown by the fact that 16.2% of the 350 samples examined between March 1st and December 1st conformed to the government specification.

A study of the laboratory data shows that a considerable portion of the gasoline sold in Montana is of better grade than is demanded by the present state standard. This statement is supported by the following data which gives averages of the analytical constants obtained from tests of 29 samples collected during October and November from various gasoline shipments furnished by one of the largest producers making consignments to Montana points. The analysis tabulated below is, therefore, representative of a very large part of the gasoline on sale in Montana today.

Average of 29 Samples.

1st drop	118° F.
20% mark	201° F.
50% mark	266° F.
90% mark	380° F.
Dry point	444° F.

Gasoline with the analytical constants tabulated above seems to satisfy the requirements of motor car owners in Montana at this time. The state oil commission has the power under provisions in the oil law to revise the standard for motor gasoline whenever in its judgment a change is necessary in order to conform to changing conditions of supply and demand or improvements in motor design. The data here reported could be used as a basis for the revision of the standard.

In this connection it should be stated that the Committee on Standardization of Petroleum products appointed by President Wilson has promulgated a new standard for motor gasoline which is expected to meet the requirements of the various states more nearly than the government standard previously discussed in this bulletin. The report of the Committee relating to the new standard is not available at this writing. When the report of the committee is released, then the oil commission will have ample data upon which to base a revision of the Montana specification for motor gasoline.

Kerosene

A total of 450 samples of kerosene were examined in the laboratory during the period covered by this report May 10th, 1919, to November 30th, 1920.

Retailers or jobbers from whom kerosene samples were received:

Adams Oil Co., Choteau; Cash Grocery Co., Hamilton; Consumers Oil Co., Harlowton; Continental Oil Co., Anaconda, Big Sandy, Billings, Big Timber, Bozeman, Butte, Cascade, Chester, Chinook, Choteau, Columbus, Conrad, Culbertson, Cut Bank, Deer Lodge, Dillon, Dodson, Drummond, Eureka, Dodson, Flaxville, Dutton, Forsyth, Fort Benton, Froid, Gilford, Glasgow, Glendive, Great Falls, Hamilton, Hardin, Harlem, Harlowton, Havre, Helena, Hingham, Judith Gap, Kalispell, Kremlin, Lewistown, Livingston, Malta, Medicine Lake, Miles City, Missoula, Mondak, Nashua, Plentywood, Polson, Poplar, Ronan, Roundup, Saco, Scobey, Shelby, Sidney, Stanford, Terry, Townsend, Twin Bridges, Wibaux, Whitefish, Whitehall, Winnett, Wolf Point; Farmers Oil Co., Scobey; Flaxville Oil Co., Flaxville; Froid Auto & Oil Co., Froid; Grey Lindeman Oil Co., Bainville, Frazer, Oswego, Plentywood, Redstone; H. Earl Clark Co., Big Sandy, Havre, Kalispell; Hover Grain & Oil Co., Antelope, Reserve; Hughes Oil Co., Glendive, Homestead, Scobey, Sidney, Terry, Wibaux; Independent Oil Co., Missoula; M. Leans, Whitefish; Montana Oil Co., Big Timber, Billings, Columbus, Great Falls, Harlowton, Helena, Kalispell, Lewistown, Livingston, Malta, Polson, Roundup; Mutual Oil Co., Big Sandy, Big Timber, Billings, Cascade, Chester, Chinook, Conrad, Columbus, Cut Bank, Deer Lodge, Dodson, Dutton, Gilford, Fort Benton, Glasgow, Great Falls, Harlem, Harlowton, Havre, Helena, Hingham, Joplin, Kalispell, Livingston, Lewistown, Malta, Missoula, Polson, Moccasin, Poplar, Ravalli, Ronan, Roundup, Saco, Sheridan, Shelby, Three Forks, Townsend, Wolf Point, Winnett; Pennsylvania Oil Co., Dillon; Pure Oil Co., Great Falls, Lewistown, Miles City, Bozeman, Stanford; Scobey Oil Co., Maddox, Scobey; Texas Oil Co., Billings, Butte, Forsyth, Helena, Livingston, Miles City, Missoula; Valley Mercantile Co., Hamilton; Tubs Oil Co., Harlem; Westland Oil Co., Bainville, Plentywood, Scobey.

Refineries Furnishing Kerosene for Montana Markets.

Kansas—Anderson & Gustefson Refineries and Marketers, Wichita; El Dorado Refining Co., El Dorado; Empire Refining Co., Independence; Evans Thewing Refining Co., El Dorado; Midland Refining Co., El Dorado; Standard Asphalt & Refining Co., Independence; Sterling Refining Co., Wichita; Vickers Marshall Oil & Refining Co., Wichita; White Eagle Refining Co., Augusta.

Minnesota—Pure Oil & Refining Co., Minneapolis.

Missouri—Evans Thewing Refining Co., Kansas City.

Oklahoma—Cushing Refining Co., Cushing; Empire Refining Co., Ponca; Sapulpa Refining Co., Sapulpa; Casden & Co., Tulsa; Standard Asphalt & Refining Co., Tulsa; Empire Refining Co., Tulsa; Yale Refining Co., Yale.

Wyoming—Glenrock Refining Co., Glenrock; Midwest Refining Co., Greybull; Mutual Refining and Products Co., Glenrock; Northwestern Refining Co., Cowley.

Standard for Kerosene

Section 7 of the Montana Oil Laws defines kerosene as follows:

That the standards of quality, purity and strength for all kerosene kept or offered for sale within the State of Montana, shall be as follows: The flash point of all kerosene shall not be less than one hundred ten (110°) degrees Fahrenheit, measured in the Tagliabue open cup and said kerosene shall contain no water or other foreign matter.

In the laboratory investigations of 450 kerosene samples submitted, only 11 were found which did not conform to the standard. In other words 97.5% of the kerosene samples were classed as satisfactory from the standpoint of flashing point.